International Surgery Journal
Sachin ID et al. Int Surg J. 2019 Aug;6(8):2849-2855
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: http://dx.doi.org/10.18203/2349-2902.isj20193329

Original Research Article

Correlation of clinical, cytological, sonological diagnosis with histopathological diagnosis in cases of clinically diagnosed solitary thyroid nodule

Idoor D. Sachin[1], Muruganathan Omprakash[2]*, Pasham Amarendra[2]

Department of General Surgery, [1]Karwar Institute of Medical Sciences, Karwar, Karnataka, [2]Pushpagiri Institute of Medical Sciences and Research Centre, Thiruvalla, Kerala, India

Received: 04 May 2019
Revised: 04 July 2019
Accepted: 05 July 2019

***Correspondence:**
Dr. Muruganathan Omprakash,
E-mail: sharash2024@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Thyroid disorders are highly prevalent in India. Clinical examination although very accurate, is inadequate in some areas. Ultrasound is most sensitive method for detection, while FNAC is most accurate method for evaluation of thyroid nodules. Both are used along with clinical examination but have drawbacks and final answer to this problem is elusive. Hence this study was planned to evaluate the usefulness of clinical examination, FNAC and USG in managing thyroid nodule.
Methods: Hundred patients with clinically solitary thyroid nodule were included. USG and FNAC of thyroid were conducted. They were operated and specimen was sent for histopathological examination (HPE). Histopathology reports were correlated with USG and FNAC.
Results: The commonest age group with thyroid pathology was 31-40 years. Majority of patients were females. All patients presented with swelling in anterior neck. Majority of patients presented between 6 months to 3 years. Consistency of nodule was firm in 88 patients and hard in 12. On USG, 70 cases were benign, 25 malignant and 5 suspicious while, on FNAC, 61 had benign lesions, 29 suspicious and 10 malignant. Commonest surgery was hemithyroidectomy. Most common lesion was benign follicular adenoma by HPE.
Conclusions: Majority of patients were females aged 31-40 years with swelling in anterior neck. Duration of swelling prior to presentation was 6 months to 3 years. Incidence of malignancy in solitary nodule of thyroid was 18%. On FNAC majority of the lesions were benign. The sensitivity and specificity of FNAC was 74.3% and 100% while for USG was 73% and 85.3% respectively.

Keywords: Solitary thyroid nodule, Ultrasound, FNAC, Histopathological examination

INTRODUCTION

The diseases of thyroid form a major share of head and neck surgeries. Thyroid disorders, especially multinodular goiter due to iodine deficiency is prevalent in India. India has the world's largest goiter belt in the SubHimalayan region with nearly 55 million cases estimated to be suffering from endemic goiter. Currently, not less than 140 million people are estimated to be living in goiter endemic regions of the country.[1,2] Clinical examination although very accurate in most cases, is inadequate in some areas especially in staging of thyroid malignancies and in detecting the multinodularity of the gland.[3-5]

The advancements in management of thyroid pathology has been possible, due to the developments in the field of imaging radiology. The application of ultrasound in the

preoperative evaluation has enhanced the armamentarium of the head and neck surgeon. Ultrasound of the neck is extremely sensitive in detecting thyroid and cervical lymph node pathology. High-resolution Ultrasound is the most sensitive, easily available and cost-effective diagnostic test available to detect thyroid nodules, measure their dimensions and identify their structure.[6] There are certain features that will help to identify benign from malignant lesions.[7]

FNAC is the most accurate and cost-effective method for evaluating thyroid nodules. Compared with surgery performed on the basis of clinical findings alone, FNAC reduces the number of thyroidectomies by approximately 50%, roughly doubles the surgical confirmation of carcinoma, and reduces the overall cost of medical care by 25%.[8]

FNAC and USG are used in association with clinical features but there are drawbacks of each technique and the final answer to the problem is still elusive. Hence the present study was undertaken to evaluate usefulness of clinical features, FNAC and USG in managing thyroid nodule.

Aims and objectives

- To correlate clinical diagnosis, ultrasonography and fine needle aspiration cytology findings with histopathological diagnosis of clinically solitary thyroid nodule.
- To calculate the sensitivity and specificity of USG and FNAC in diagnosing benign and malignant lesions.

METHODS

A prospective study was conducted in the Department of General Surgery, Pushpagiri Institute of Medical sciences and research centre, Thiruvalla from December 2012 to October 2014. Hundred patients with clinically solitary thyroid nodule who met the inclusion criteria were randomly included in the study. The study was conducted after approval from Institutional ethics committee.

Inclusion criteria

Inclusion criteria were patients of either sex aged between 11-70 years; patients with clinically detected solitary thyroid nodule; patients who are fit for surgery.

Exclusion criteria

Exclusion criteria were patients with diffuse enlargement of thyroid or with multiple nodules.

All patients were initially examined clinically after taking a detailed history. They were investigated with USG and FNAC of the thyroid.

USG thyroid: The nodules were evaluated for size, location, echotexture, margins, presence of halo, calcification, vascularity, accessory nodules, associated cervical lymphadenopathy and consistency (solid, cystic or mixed) in order to differentiate between benign and malignant nodules.

FNAC: All the patients in the study were subjected to FNAC and the results of FNAC were interpreted as benign, malignant, suspicious or inadequate aspirate.

Then, all the patients were subjected to surgery and specimen was sent to biopsy. Finally, the histopathology reports were correlated with the findings of USG and FNAC in order to evaluate their sensitivity and specificity by statistical methods.

Statistical analysis

Age was presented as mean±standard deviation. The data was analysed and presented as percentages for other categorical variables. Comparison of clinical features, USG and FNAC with HPE in detecting malignancy was compared using Chi–square test.

RESULTS

Age and sex

The age of the patients was range from 11-70 years. The commonest age group with thyroid pathology was between 31- 40 years and mean age group was 35.07 years (Table 1).

Table 1: Age and sex distribution of patients.

Age (year)	Male (n=30)	Female (n=70)	Total (n=100)
11-20	1	9	10
21-30	6	24	30
31-40	9	27	36
41-50	9	5	14
51-60	4	4	8
61-70	1	1	2

Majority of the patients were females i.e. 70 (70%) and male to female ratio is 1: 2.3 (Table 1).

Presenting complaints

All the patients presented with swelling in the anterior neck region. In addition to swelling in the neck, fourteen patients presented with pain in the swelling, three with difficulty in breathing and eight with difficulty in swallowing. Twelve of the patients who presented with thyroid swelling had cervical lymphadenopathy on clinical examination. No patient had any change in voice or history suggestive of hypo/hyperthyroidism features.

Duration of complaints

The duration of complaints ranged from 1 week to 8 years. Majority of the patients presented between 6 months to 3 years.

Family history and past history

None of the patients had any significant history.

Clinical findings

The clinical diagnosis was solitary nodule of the thyroid. The consistency of the nodule was firm in 88 patients and hard in 12 patients. Cervical lymph nodes were palpable in 12 patients. Carotid pulse was palpable in all the patients. Clinical findings of hypo / hyperthyroidism were absent in all patients.

Ultrasonography

Based on various ultrasonographical features, cases were classified into benign, suspicious and malignant. The benign category occupies the major group with 70 (70%) cases, followed by malignant 25 (25%) cases and suspicious 5 (5%) cases (Table 2).

Table 2: Distribution of lesions on USG.

Category	Lesion	No. of cases
Benign (n=70)	Cystic	12
	Hyperechoic nodule	42
	MNG	16
Suspicious (n=5)	Suspicious MNG	3
	Suspicious mixed echogenic	2
Malignant (n=25)	Mixed	25

Table 3: Distribution of lesions on FNAC.

Sl. No.	Classification	FNAC lesions	
		Category	**No.**
1.	Benign (n=61)	Nodular goiter	15
		Colloid nodule	26
		Benign cystic lesion	17
		Hyperplastic thyroid nodule	03
2.	Suspicious (n=29)	Follicular neoplasia	29
3.	Malignant (n=10)	Papillary carcinoma	10
4.	Inadequate (nil)	Nil	Nil

Fine needle aspiration cytology

The benign category occupies the major group with 61 (61%) cases, followed by suspicious 29 (29%) cases and malignant 10 (10%) cases. There is no inadequate or insufficient cytological smear (Table 3).

Histopathological diagnosis

The most common lesion is benign follicular adenoma 33 (33%) and the least common is benign cystic lesion (Table 4).

Table 4: Results of histopathological diagnosis

Sl. No.	Histopathological diagnosis	n=100
1	Colloid nodule	26
2	Nodular goiter	07
3	Benign cystic lesion	02
4	Hyperplastic thyroid nodule	02
5	Benign follicular adenoma	33
6	MNG	12
7	Papillary carcinoma	18

Comparison of clinical diagnosis with histopathology

When clinically lymph nodes were palpable, majority of the cases proved to be malignant and this association was significant. Clinically hard nodules proved to be malignant in 92% of cases and this association was significant. In this study, pain was associated only with benign lesions but the association was not significant. In this study, dysphagia was associated only with benign lesions but the association was not significant. In this study, dyspnoea was associated only with benign lesions but the association was not significant (Table 5).

Table 5: Comparison of clinical diagnosis with histopathology.

Clinical diagnosis	Histopathological diagnosis	No. of cases
Solitary nodule of thyroid	Hyperplastic thyroid nodule	2
	Colloid nodule	26
	Nodular goiter	7
	Benign cystic lesion	2
	Benign follicular adenoma	33
	Multinodular goiter	12
	Papillary carcinoma	18

Correlation of USG with histopathological diagnosis

The USG diagnosis of benign lesion was confirmed in 66 (93.05%) out of 70 cases and was disputed in 4 (6.09%) cases by histopathology which turned out to be malignant. In 5 USG suspects, histopathology revealed benign in 3 cases and malignant lesion in 2 cases. Among 25 USG diagnoses of malignant lesions, 13 were confirmed by histopathology, and 12 were disputed to be benign (Table 6).

Table 6: Correlation of USG with Histopathological diagnosis.

Category	USG lesions	Histopathological diagnosis	
		Category	**No.**
Benign (n=70)	Cystic (n=12)	Colloid nodule	9
		Nodular goiter	3
	Hyperechoic nodule (n=42)	Benign follicular adenoma	25
		Colloid nodule	14
		MNG	2
		Papillary carcinoma	1
	MNG (n=16)	Papillary carcinoma	3
		MNG	5
		Hyperplastic thyroid nodule	2
		Benign cystic lesion	2
		Benign follicular adenoma	4
Suspicious (n=5)	Suspicious MNG (n=3)	Nodular goiter	2
		MNG	1
	Suspicious mixed echogenic (n=2)	Papillary carcinoma	2
Malignant (n=25)	Mixed echogenic nodule (n=25)	Nodular goiter	3
		MNG	4
		Papillary carcinoma	13
		Benign follicular adenoma	3
		Colloid nodule	2

Table 7: Correlation of FNAC lesions with histopathology.

Category	FNAC lesions	Histopathological diagnosis	
Benign (n=61)	Nodular goiter (n=15)	Benign follicular adenoma	3
		Nodular goiter	4
		MNG	8
		Papillary carcinoma	0
	Benign cystic lesion (n=17)	Colloid nodule	4
		Nodular goiter	3
		Benign cystic lesion	1
		Benign follicular adenoma	5
		MNG	4
	Colloid nodule (n=26)	Benign follicular adenoma	7
		Colloid nodule	19
		MNG	0
	Hyperplastic thyroid nodule (n=3)	Benign follicular adenoma	3
Malignant (n=10)	Papillary carcinoma (n=10)	Papillary carcinoma	10
Suspicious (n=29)	Follicular neoplasia (n=29)	Benign follicular adenoma	15
		Colloid nodule	3
		Hyperplastic thyroid nodule	2
		Papillary carcinoma	9

Correlation of FNAC lesions with histopathology

In 61 cytologically diagnosed benign cases, all proved to be benign. Only malignant lesion found was papillary carcinoma in 10 (10%) cases. All the 29 cases of follicular neoplasia were subjected to surgery and correlated with histopathology. Twenty cases were found to be benign and nine cases to be malignant (Table 7).

Comparison of USG with FNAC

The USG diagnosis of benign lesion was confirmed in 52 (74.25%) out of 70 cases and was suspicious in 18 cases by FNAC. Out of 5 suspect cases, 2 turned out to be malignant. Out of 25 malignant cases, 9 were proved by FNAC and 10 turned out to be suspicious. Among total 100 cases of solitary thyroid nodule, USG revealed multiple nodules in 17 cases. Thus USG was more

sensitive diagnostic modality to detect nodularity (Table 8).

Assessment of nodularity by various methods

On clinical examination, all cases had solitary nodules whereas USG revealed solitary nodules in 83 cases and multiple nodules in remaining 17 cases (Table 9).

Type of surgeries performed

The commonest performed surgery was Hemithyroidectomy, which accounted for 76 (76%) cases. Functional neck dissection was done in 13 cases of papillary carcinoma of thyroid where lymph nodes were palpable (Table 10).

Table 8: Comparison of USG with FNAC.

Category	USG lesions	FNAC	
		Category	**No.**
Benign (n=70)	Cystic (n=12)	Colloid nodule	6
		Benign cystic lesion	6
	Hypoechoic nodule (n=42)	Colloid nodule	20
		Benign cystic lesion	7
		Nodular goiter	3
		Hyperplastic thyroid nodule	2
		Follicular neoplasm	10
	MNG (n=16)	Benign cystic lesion	4
		Nodular goiter	4
		Follicular neoplasm	8
Suspicious (n=5)	Suspicious MNG (n=3)	Nodular goiter	3
	Suspicious mixed echogenic (n=2)	Papillary carcinoma	2
Malignant (n=25)	Mixed echogenic nodule (n=25)	Nodular goiter	6
		Papillary carcinoma	9
		Follicular neoplasm	10

Table 9: Assessment of nodularity by various methods.

Modality	Nodularity	
	Solitary	Multiple
Clinical examination	100	-
USG	83	17

Table 10: Type of surgeries performed.

Sl. No.	Type of surgery	Number (n=100)
1	Hemithyroidectomy	76
2	Near total thyroidectomy	08
3	Total thyroidectomy	16
4	Functional neck dissection	13

Comparison of USG with FNAC

Benign: The sensitivity was 85.2%, specificity- 60%, positive predictive value-74.28% and negative predictive value-70%

Malignant: sensitivity was 90%, specificity- 82%, positive predictive value-36%, negative predictive value-98.6%.

Comparison of USG with histopathology

Benign: sensitivity was 80.4%, specificity- 77.7%, positive predictive value-94.28% and negative predictive value-46%

Malignant: sensitivity was 73%, specificity- 85.3%, positive predictive value-52% and negative predictive value-93.3%.

Comparison of FNAC with histopathology

Benign: sensitivity was 81.3%, specificity- 100%, positive predictive value-100%, negative predictive value-46%.

Malignant: sensitivity was 74%, specificity- 100%, positive predictive value-100% and negative predictive value-91%.

Comparison of preop evaluation with post-op report

Irrespective of the USG verdict, FNAC reports differentiate significantly between benign and malignant lesions. When FNAC is suspicious, USG does not still help to differentiate between Benign and Malignant lesions.

DISCUSSION

The present study was undertaken to evaluate the usefulness of clinical examination, USG and FNAC of thyroid in the management of thyroid nodule and compare the efficacy of each of the investigation. Total 100 cases of solitary thyroid nodule were evaluated in Pushpagiri Institute of Medical sciences and research Centre, Thiruvalla from December 2012 to October 2014.

In the present study, age of the patient ranged from 11-70 years with a median age of 35 years. Age distribution of the present study was comparable to the study of Jose RM et al.[9] In the study of Mitra et al, age range was 16–70 and median age was 39.6 yrs.[10]

The number of males in the present study was 30 (30%) and the females were 70 (70%) with a male to female ratio of 1:2.3. In the area where study was conducted, most of the patients with thyroid nodule were females between 30 to 50 years. This is comparable to studies done by Afroze et al, Sekhri et al and Tabaqchali et al.[11-13]

The commonest clinical presentation was the presence of swelling in front of the neck and majority patients presented between 6 months to 3 years. History and symptoms did not give any significant contribution in detecting malignancy in this study. Most of the pressure symptoms (dysphagia, dyspnoea) were associated with benign lesions but the association was not significant.

Clinical examination has given clues towards malignancy. Most of cases where lymph nodes were palpable turned out to be malignant on biopsy and this association was significant. So, based on this study, malignancy can be strongly suspected in cases where lymph nodes were palpable.

Another clinical finding that gave clue regarding malignancy was consistency of the nodule. Nodules which were hard were proved to be malignant in majority of cases. The association between nodule consistency and malignancy was significant. So, based on this study, malignancy can be suspected when nodules are hard in consistency.

Ultrasound is one of the useful investigation tool in evaluation of thyroid nodules. Many of the solitary nodules will be diagnosed as multinodular swellings on ultrasound. USG detects nodules as small as 3 mm in diameter. The thyroid nodules on USG were subdivided into 3 groups - benign, suspicious and malignant on the basis of various sonographic features. Features suggestive of malignancy on USG are - hypoechoic pattern, incomplete peripheral halo, irregular margins, internal micro calcification, increased vascularity, presence of cervical lymphadenopathy and peripheral degeneration in mixed nodules. Features suggestive of benign diseases on USG are-halo sign, variable echogenecity, multinodularity, large cystic lesion, diffusely nodular in homogenous gland and peripheral calcification. Main drawbacks of the USG are it is operator dependent and there are no pathognomonic features that will diagnose malignancy. So ultrasound should be combined with FNAC for the better results.

In our study, out of 25 cases diagnosed to be malignant on USG, 13 cases were confirmed on histopathology and remaining 12 cases were benign. In 5 cases in whom USG gave false negative diagnosis of benign disease, histopathology revealed papillary carcinoma. The overall sensitivity in our series was 80.4%, 73%, while the specificity was 77.7%, 85.3% for benign and malignant lesions on USG respectively. Similar results were observed in studies by Watters et al and Jones et al.[14,15] Watters et al emphasized that the USG has added advantage of allowing the whole gland to be examined rather than the dominant nodule but was limited by the fact that no features were pathognomonic for malignancy. Hence USG should be regarded as complementary rather than an alternative investigation to FNAC in the management of solitary thyroid nodule.

The risk of thyroid cancer is less with multiple nodules than with the solitary nodules. High resolution real-time USG is far better than clinical examination in detecting thyroid nodularity. It has been observed that for a thyroid nodule to be detected by palpation, it must be atleast 1 cm in diameter, while USG detects nodules as small as 3 mm in diameter.

The overall sensitivity of FNAC in our series was 81.3%, 74%, while the specificity was 100%, 100% for benign and malignant lesions respectively. These results were comparable with the studies done by Altavilla et al and Kim et al.[16,17] In this study, 10 cases diagnosed as malignancy on FNAC were proved to be malignant on biopsy. So distribution is 10%, which is comparable with the study by Sarda.[18] Main drawback of FNAC is non diagnostic yield and suspicious diagnosis. Suspicious diagnosis may be due to difficulty in differentiating between follicular adenoma and carcinoma. And the other reason may be due to follicular pattern in papillary carcinoma. There were no cases of non diagnostic yield on FNAC in this study, but 29 cases were reported as suspicious (follicular neoplasms). Out of these 29, 9 were found to be malignant on final histopathology examination. Thus, an overall malignancy rate of about 31.03% for the suspicious group was found. Because of this high incidence of malignancy in suspicious lesions, surgical removal of these nodules should be strongly considered in these cases. The overall incidence of malignancy in solitary thyroid nodules varies from 10%-30% according to various studies. In our study, the overall incidence of malignancy in solitary nodule was 18%.

Irrespective of the USG verdict, FNAC reports differentiate significantly between benign and malignant lesions. When FNAC is suspicious, USG does not still

help to differentiate between benign and malignant lesions as shown in this study.

Extent of the surgery was decided on the nature of the lesion and the risk group classification - hemithyroidectomy was the most commonly performed surgery in our study. Except transient pos0074 operative hypocalcaemia, there were no complications of the surgery.

CONCLUSION

Nodular goiter was more common in females (M: F ratio 1:2.3). Majority of the patients were in the age group of 31-40 years at presentation. Swelling in the anterior aspect of neck was the commonest mode of presentation. In majority of the patients, duration of swelling prior to presentation was between 6 months and 3 years. The incidence of malignancy in solitary nodule of thyroid was 18%. USG proved to be a more sensitive modality to evaluate the nodularity of the thyroid than clinical evaluation. USG with a sensitivity of 73% and specificity of 85.3%, helps in diagnosing doubtful cases. On FNAC, majority of the lesions were benign, with nodular goiter being the largest group. All the lesions diagnosed malignant on FNAC, were proved by histopathology. Among suspicious lesions on FNAC, 31.03% proved to be malignant, indicating the need for surgery. FNAC is the diagnostic modality of choice for the initial workup of thyroid nodule with sensitivity of 74.3% and specificity of 100%. Hemithyroidectomy was the most commonly performed surgery for the thyroid. Except transient hypocalcaemia, there were no post-operative complications.

ACKNOWLEDGEMENTS

Authors would like to acknowledge the staff of General surgery, PIMS and RC, Tiruvalla, Kerala, India for their help and support.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Park K. Nutrition and Health, Park's text book of Preventive and Social Medicine 18th edition. Banarasidas Bhanot publishers; 2005: 419-420.
2. Unnikrishnan AG and Menon UV. Thyroid disorders in India: An epidemiological perspective. Indian J Endocrinol Metab. 2011l;15(Suppl2):S78–S81.
3. Williams NS, Christopher JK. O'Connell BPR. The Thyroid and Parathyroid Glands, chapter 51, 26th Edition. Bailey and Love's Short Practice of Surgery; 2012: 741-787.
4. Townsend CM, Beauchamp RD, Evers BM, Mattox K. Thyroid, Chapter 36, Sabiston Textbook of Surgery, 20th Edition; 2017:881-922.
5. Brunicardi CF, Anderson DK, Billiar TR, Dunn DL, Hunter JG, Matthews JB, et al. Thyroid, Chapter 38, 10th Edition. Schwartz's Principles of Surgery. 2015: 1521-1556.
6. Horvath E, Majlis S, Rossi R, Franco C, Niedmann JP, Castro A, et al. An ultrasonogram reporting system for thyroid nodules stratifying cancer risk for clinical management. J Clin Endocrinol Metab.2009;94:1748–51.
7. Moon WJ, Jung SL, Lee JH. Benign and malignant thyroid nodules: US differentiation: Multicenter retrospective study. Radiology. 2008;247:762–70.
8. Mazzaferri EL. Management of a solitary thyroid nodule. N Engl J Med. 1993;328:553–9.
9. Jose RM, Smile SR, lyengar KR. The role of imprint cytology in intraoperative diagnosis of thyroid swelling. Indian J Pathol Microbiol. 2002;45(4):393-6.
10. Mitra RB. Fine needle aspiration cytology of thyroid gland and histopathological correlation- Revisited. JIMA. 2002;100(6):49-54.
11. Afroze N, Kayam N, Hasan SH.Role of fine needle aspiration cytology in the diagnosis of palpable thyroid lesions. Indian J Pathol Microbiol. 2002;45(3):241-6.
12. Sekhri T, Sankar JK, Bansal M. Role of different diagnostic modalities in the evaluation of solitary thyroid nodule: Experience in a tertiary referral centre of North India. IJNM. 2001;16(3):105-8.
13. Tabaqchali MA, Hanson JM, Johnson SJ, Wadehra V, Lennard TW, Proud G. Thyroid aspiration cytology in Newcastle: A six year cytology histology correlation study. Ann R Coll Surg Engl. 2000;82:149-55.
14. Watters DA, Ahuja AT, Evans RM, Chick W, King WW, Metreweli C, et al. Role of USG in the management of thyroidnodule. Am J Surg. 1998;164:654-7.
15. Jones AJ, Aitman TJ. Comparision of Fine Needle Aspiration, USG and Radionucleotide Scan in management of thyroid nodules. Post Grad Med J. 1990;66:914-99.
16. Altavilla G, Pascale M. FNAC of thyroid gland disease Acta Cytologica. 1990;34:251-6.
17. Kim DW, Lee EJ, Kim SH, Kim TH, Lee SH, Kim DH, et al. USG guided Fine Needle Aspiration biopsy of thyroid nodules: comparision in efficacy according to nodule size. Thyroid. 2009;19(1):27-31.
18. Sarda AK, Gupta A, Jain PK, Prasad S. Management options for solitary thyroid nodules in an endemic goitrous area. Postgrad Med J. 1997;73:560-4.

Cite this article as: Sachin ID, Omprakash M, Amarendra P. Correlation of clinical, cytological, sonological diagnosis with histopathological diagnosis in cases of clinically diagnosed solitary thyroid nodule. Int Surg J 2019;6:2849-55.